

IPv6 Implementation Case Study at São Paulo / Brazil

CTBC (AS27664)

LACNIC XI / Salvador, BA - Brazil
Sixth Latin American IPv6 Forum - FLIP-6

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CTBC AS27664

IPv4 Actual External Connectivity

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Suggested URL to Visit & Special Thanks for the Support

Objective

The main objective of this work is to present an overview about CTBC (AS27664) IPv6 implementation case study.

Introduction – CTBC (Companhia de Telecomunicações do Brasil Central)

Concession Areas



Expansion Areas



Introduction – CTBC Internet Services

CTBC is a Telecommunication Company, a Network Service Provider (NSP) and an Internet Service Provider (ISP)

CTBC Telecom (AS16735)

Covered Areas: Brazil – different states (MG, SP, RJ, etc)

Customers: Business and residential (ADSL, etc)

CTBC Multimídia Data Net (AS27664)

Covered Areas: São Paulo city and neighborhood

Customers: Business (dedicated links)

AS27664 was chosen to start IPv6 implementation

Lower network and services complexity

Introduction – CTBC AS27664 Basic Information

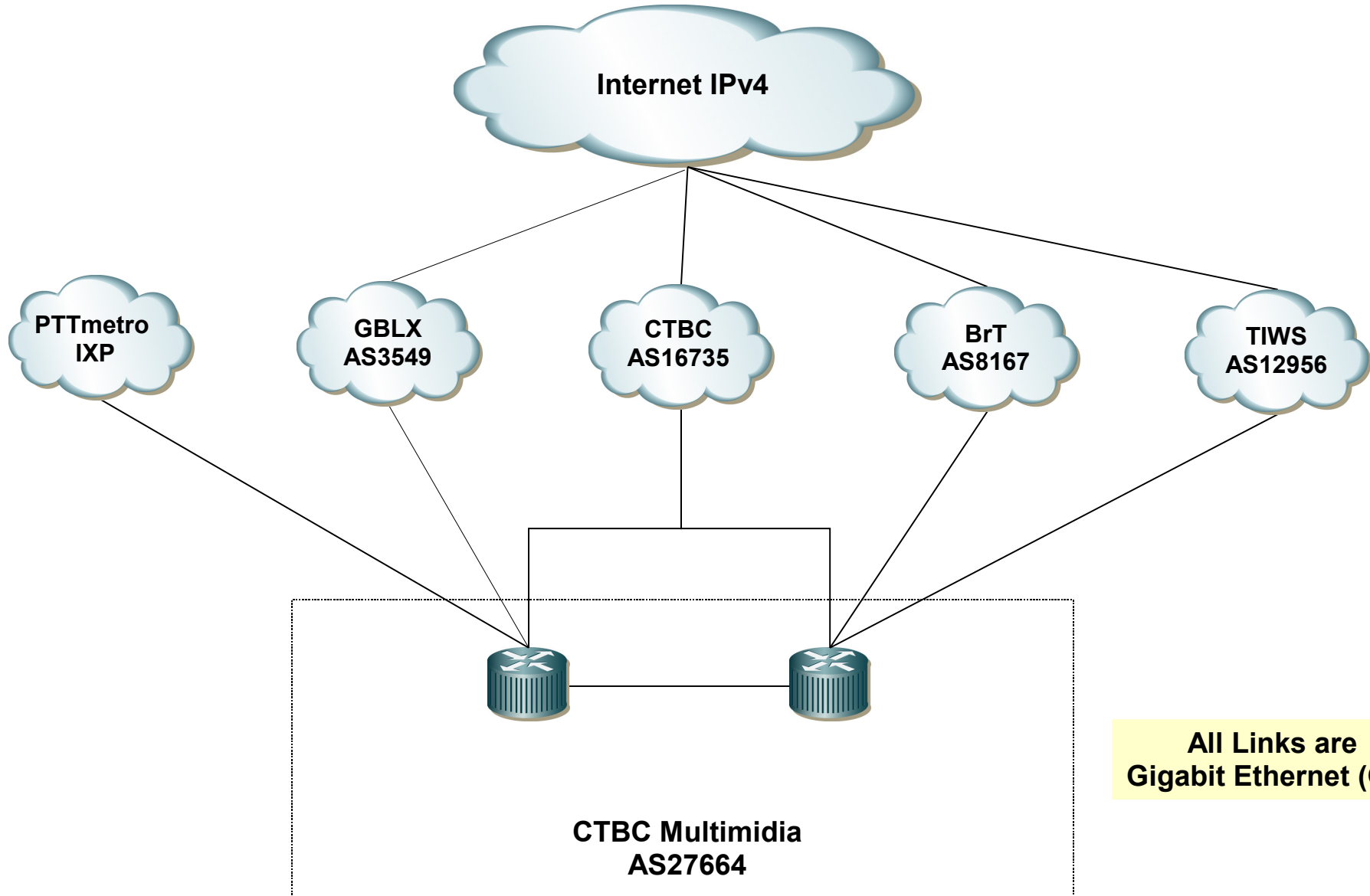
CTBC owns a Metro Ethernet network based on an underground fiber optic mesh covering all relevant corporations concentration areas in São Paulo.

Which results in a high quality and availability network (L1 and L2).

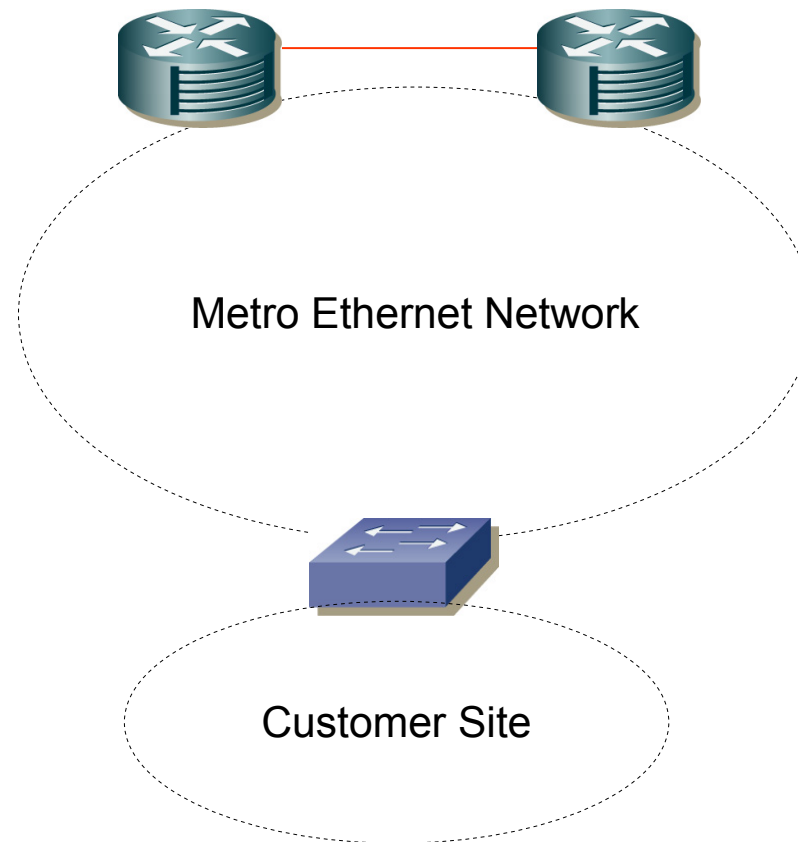
CTBC AS27664 provides dedicated Internet access to corporations located in São Paulo city. It also provides IP transit for Autonomous Systems customers.

CTBC Internet access is a good quality recognized service traditionally based on IPv4.

CTBC AS27664 IPv4 Actual External Connectivity

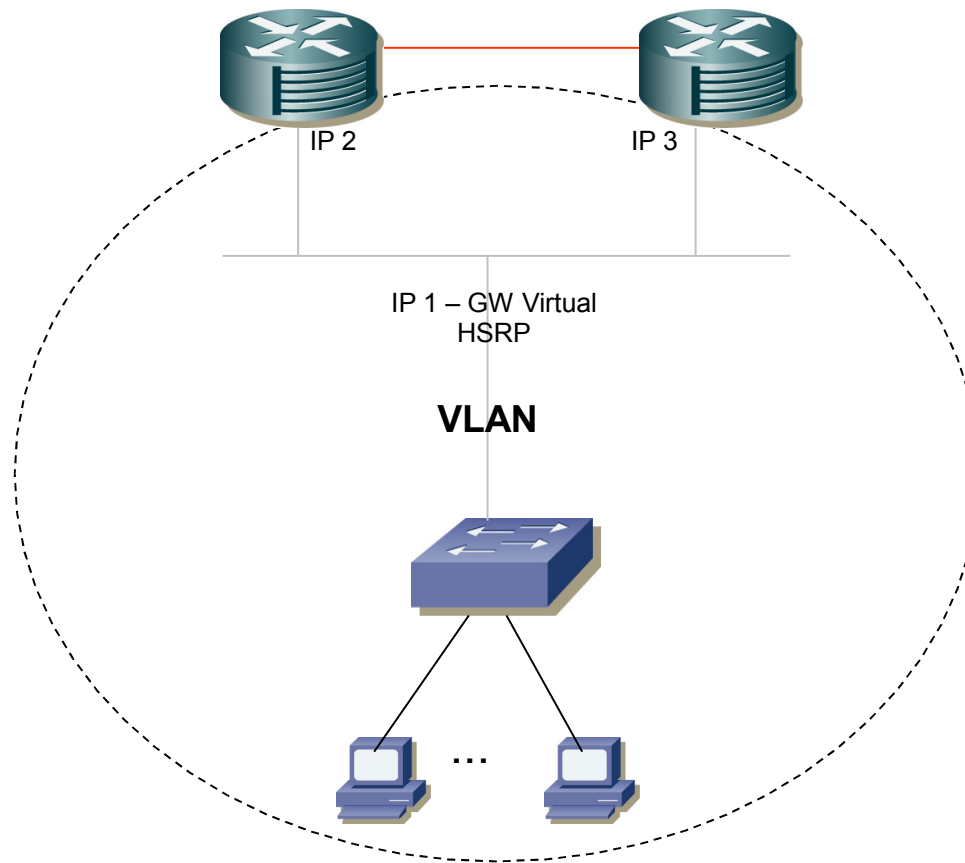


CTBC AS27664 Customers Last Mile (L2 redundant)



CTBC AS27664 IPv4 Internet Customers L3 Redundancy Access

HSRP: Hot Standby Router Protocol



CTBC AS27664 IPv6 History Prior to 2008

- Some preliminary internal use on laboratory environments started in 2006.
- Network laboratory compatibility tests run on 2007.
- Brazilian Network Engineering and Operations Working Group (GTER) 24th Meeting in 2007

IPv6 adoption stimulus

<http://gter.nic.br/reunioes/gter-24>

IPv4 BGP Table Reduction Analysis (can probably impact on IPv6 adoption)

<ftp://ftp.registro.br/pub/gter/gter24/04-bgp-reducao-cidr.pdf>

<http://www.intron.com.br/doc/bgp/gter24-en-summary.eascenco.bgp-table-red.rir-min-alloc.20071026.v-2007112901.html>

- Followed IETF discussions about IPv6 in 2007.

CTBC AS27664 IPv6 Strategy

Decisions:

- ✓ **To implement native IPv6 in the logical infrastructure**

Dependency on native IPv6 peering and transit establishment.

Avoid tunnels use.

- ✓ **To provide Internet access in dual stack mode**

CTBC AS27664 IPv6 Recent History (2008) 1/2

- On January 2008, CTBC asked for and received the IPv6 CIDR 2001:1290::/32 allocation from Registro.br (BR NIR).
- IPv6 implementation on Backbone and access networks.
- Activation of the first customer in dual stack mode:
my personal workstation (2Mbps dedicated Internet access)
- Changed its Gigabit Ethernet connection to PTTmetro (NIC.br IXP - <http://sp.ptt.br/>) from access to trunk and enabled the IPv6 VLAN.
- Established IPv6 peering with Registro.br (AS22548) and RNP (AS1916) by PTTmetro PIX.
- External IPv6 tests and use – DNS resolution and Registro.br registration services.
- Enabled IPv6 transit with Global Crossing (AS3549) extending its IPv6 connectivity to the Internet.
- Performed basic Internet IPv6 real tests:
Identified some initial connectivity problems (higher latency to some sites compared to IPv4)
Identified some IPv6 security exposure vulnerabilities
Next Brazilian Security Working Group Meeting (GTS-11 - <http://gts.nic.br/>) on 1 Jun 2008

CTBC AS27664 IPv6 Recent History (2008) 2/2

- Start to implement internal changes for IPv6 full adoption:
 - IPv6 address plan (more complex than IPv4)
 - Staff training
 - IP Math with hexadecimal system
 - IPv6 protocol provisioning, configuration, support and security
 - Internal systems adaptation (provisioning, management, security, etc)
- IPv6 CIDR DNS delegation and designation (customers allocation) procedures validation
- Activation of CTBC IPv6 only Internet services for validation purposes
 - Domain: ctbcv6.com.br
- Established partnerships for IPv6 adoption:
 - CasaBlanca – real customer pilot project
 - Lintronix – external company
- Validated the solution and sold the first IPv6 transit customer

CTBC AS27664 IPv6 Implementation References

- **Cisco**

- Cisco IOS IPv6 Command Reference (PDF - 15 MB)

- http://www.cisco.com/en/US/docs/ios/12_3t/ipv6/ipv6book.pdf

- Configuring IPv6

- http://www.cisco.com/en/US/docs/security/fwsm/fwsm31/configuration/guide/ipv6_f.pdf

- Configuring First Hop Redundancy Protocols in IPv6

- <http://www.cisco.com/en/US/docs/ios/ipv6/configuration/guide/ip6-fhrp.html>

- Gateway Load Balancing Protocol (GLBP)

- Hot Standby Router Protocol (HSRP) version 2

- **Linux**

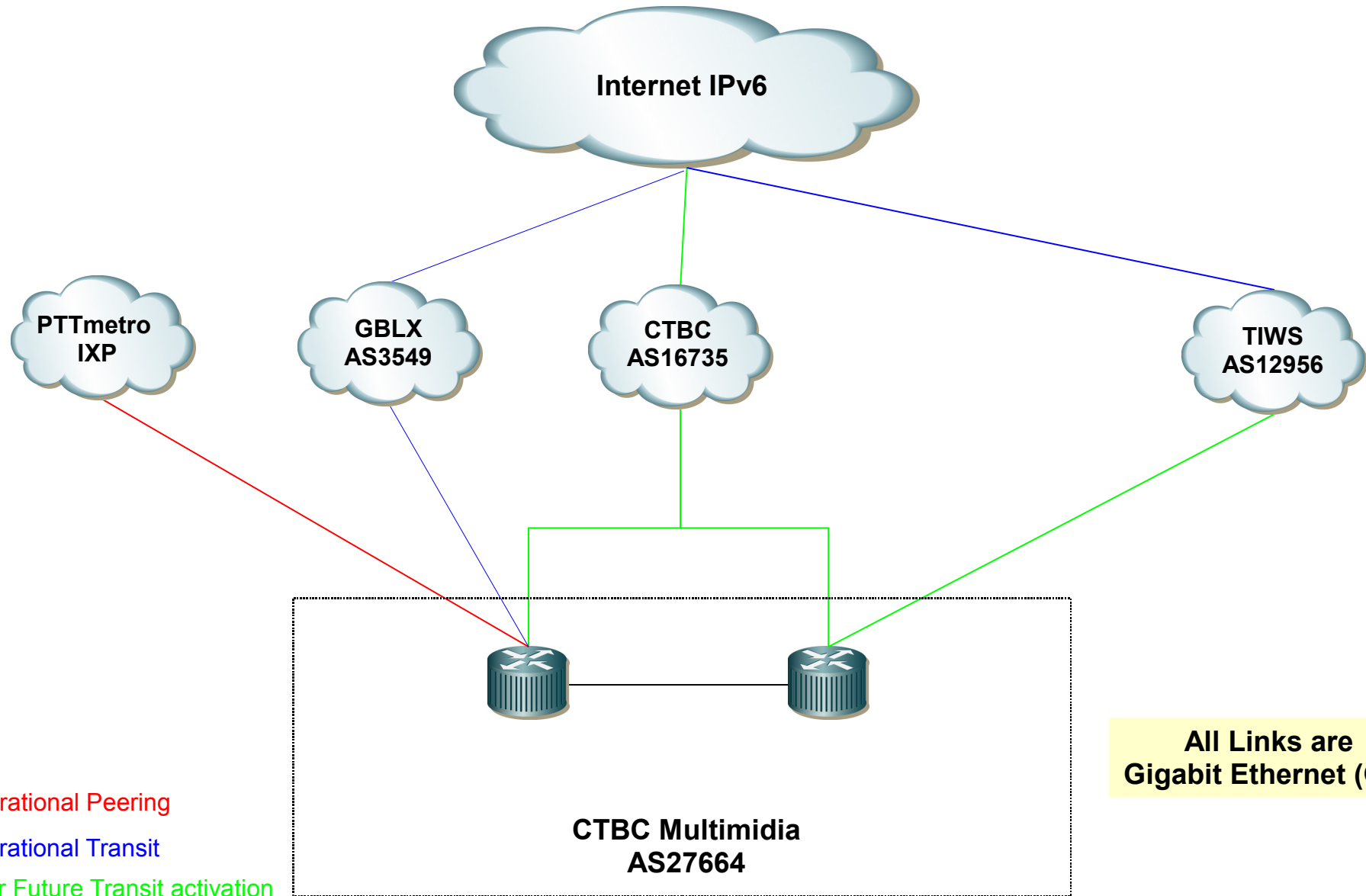
- <http://www.tldp.org/HOWTO/Linux+IPv6-HOWTO/index.html>

- <http://people.debian.org/~csmall/ipv6/setup.html>

- **FreeBSD**

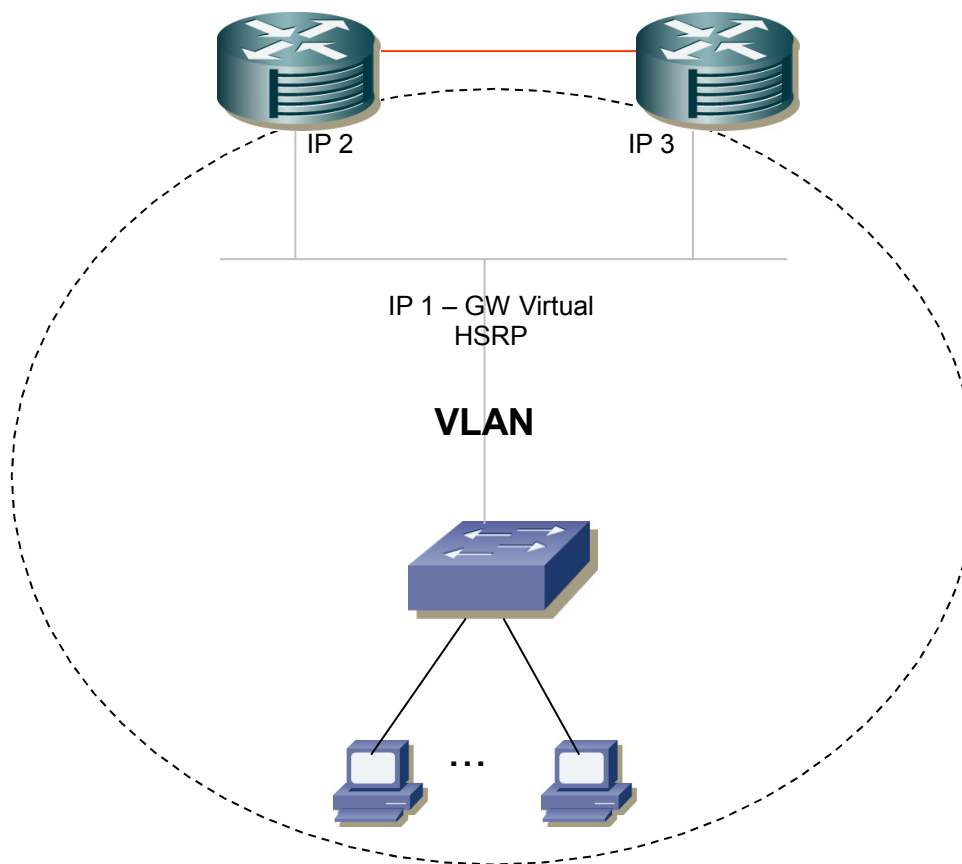
- <http://www.freebsd.org/doc/en/books/handbook/network-ipv6.html>

CTBC AS27664 IPv6 Actual External Connectivity



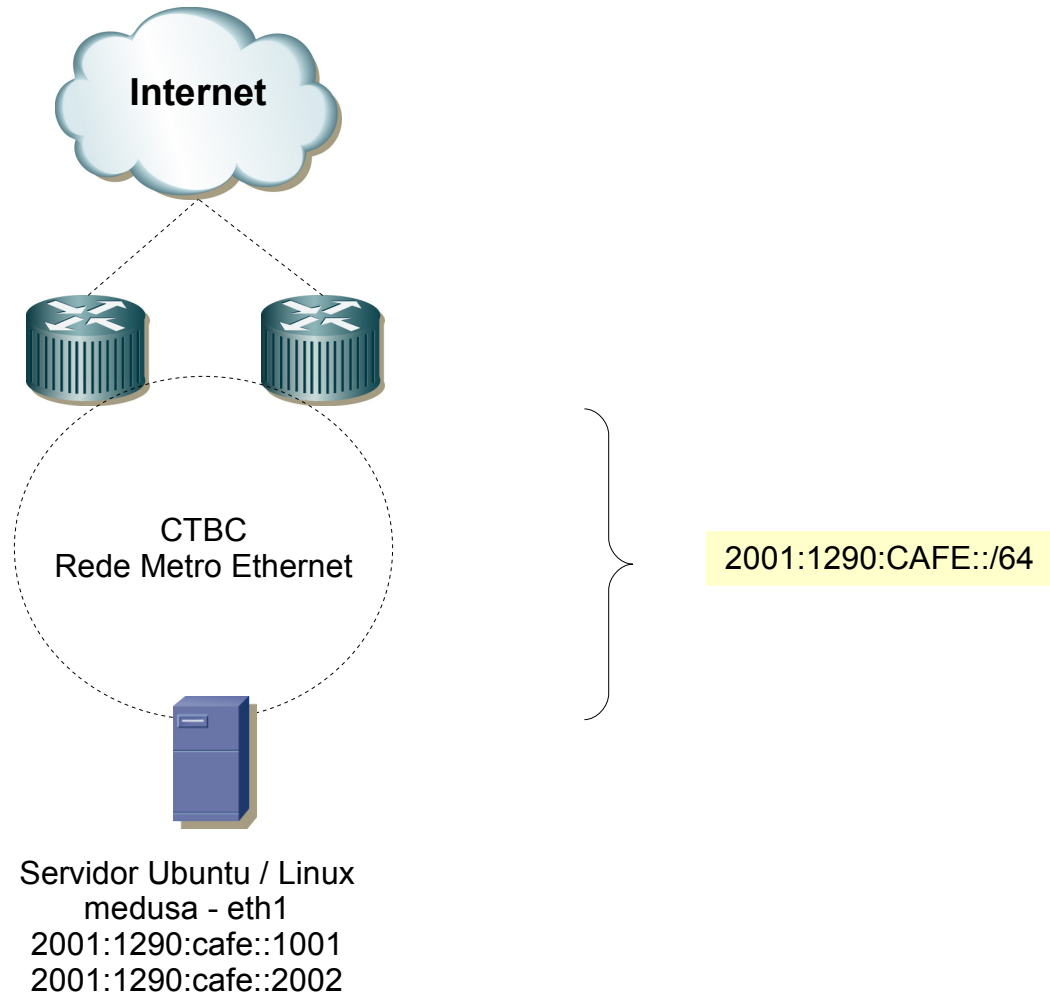
CTBC AS27664 IPv6 Internet Customers L3 Redundancy Access

HSRPv2: Hot Standby Router Protocol Version 2



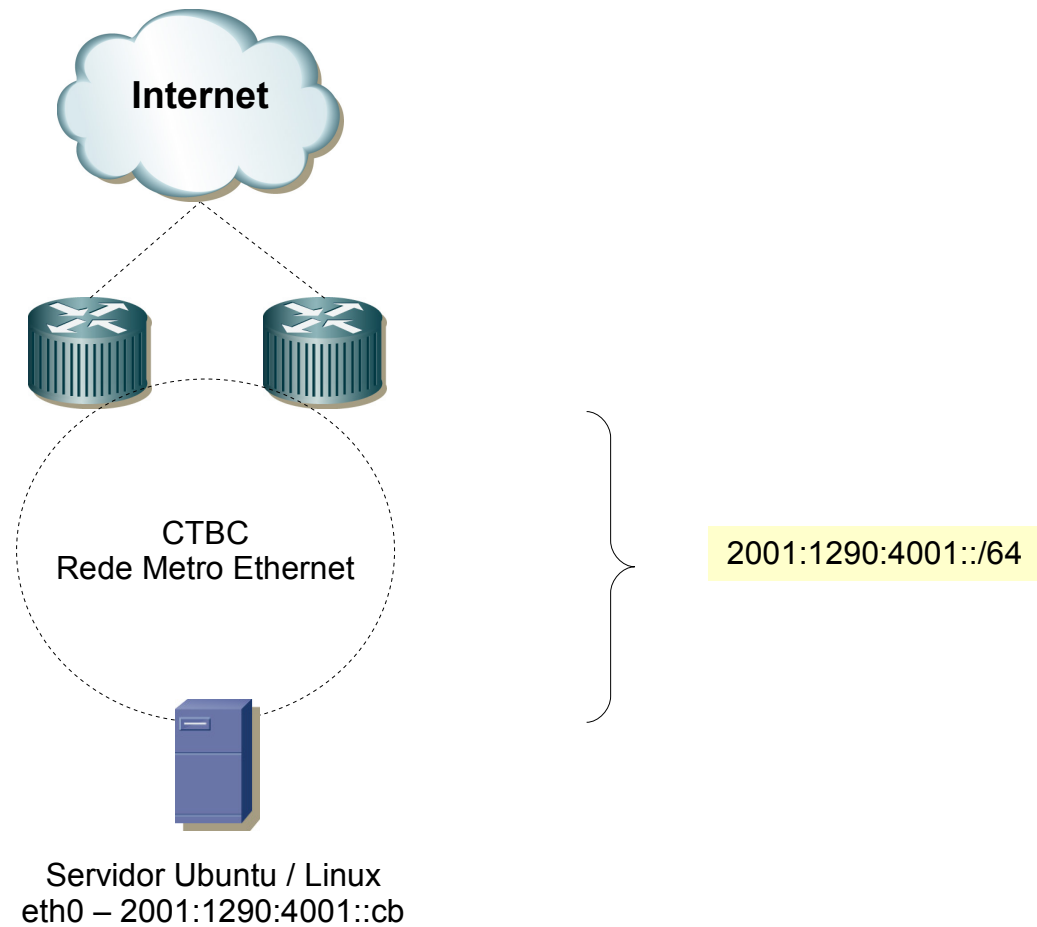
Currently in final validation step and Neighbor Discovery (ND) Protocol is temporarily disabled for security matters

CTBC AS27664 IPv6 – Laboratory Logical Diagrams 1/4

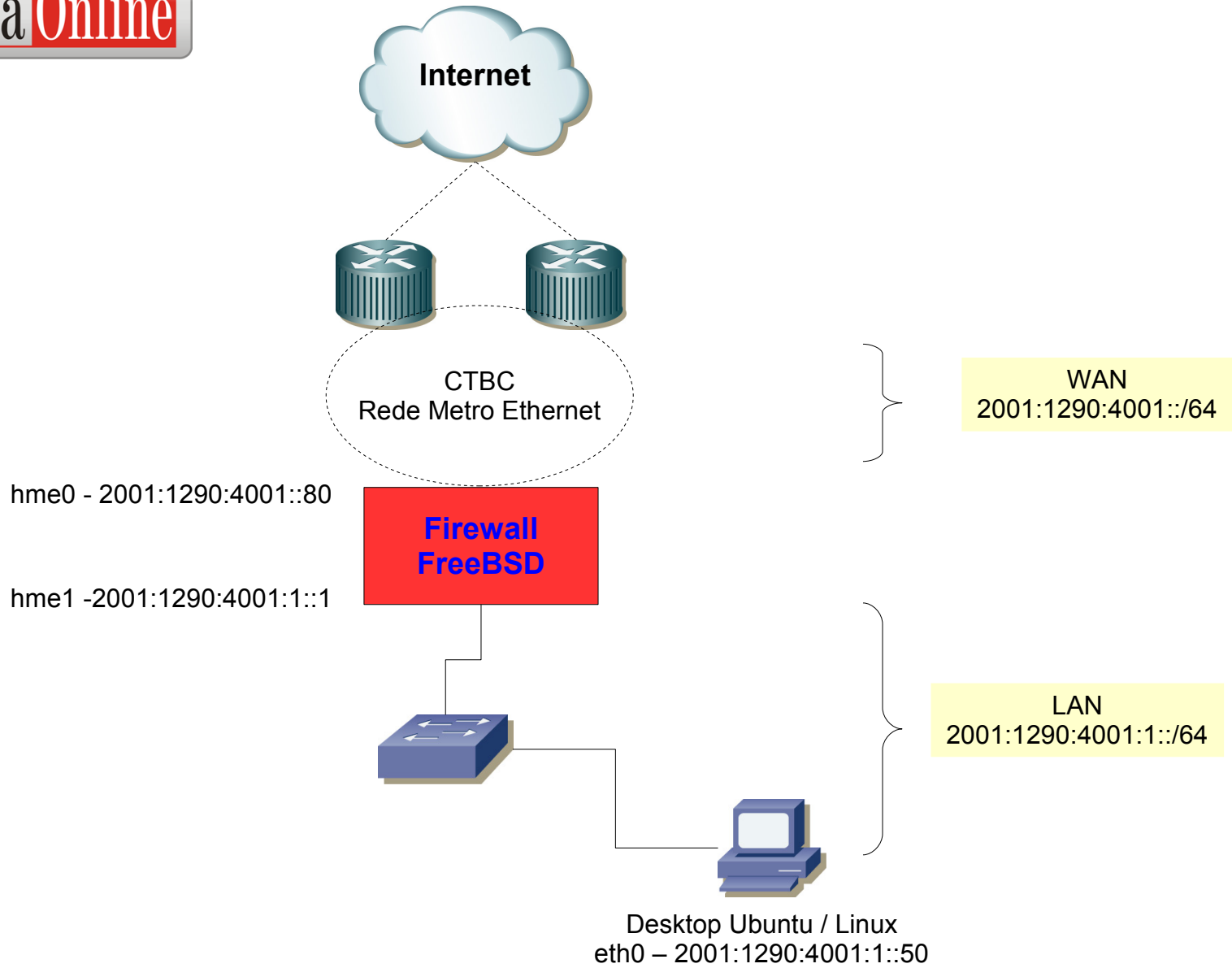


CTBC AS27664 IPv6 – Laboratory Logical Diagrams 2/4

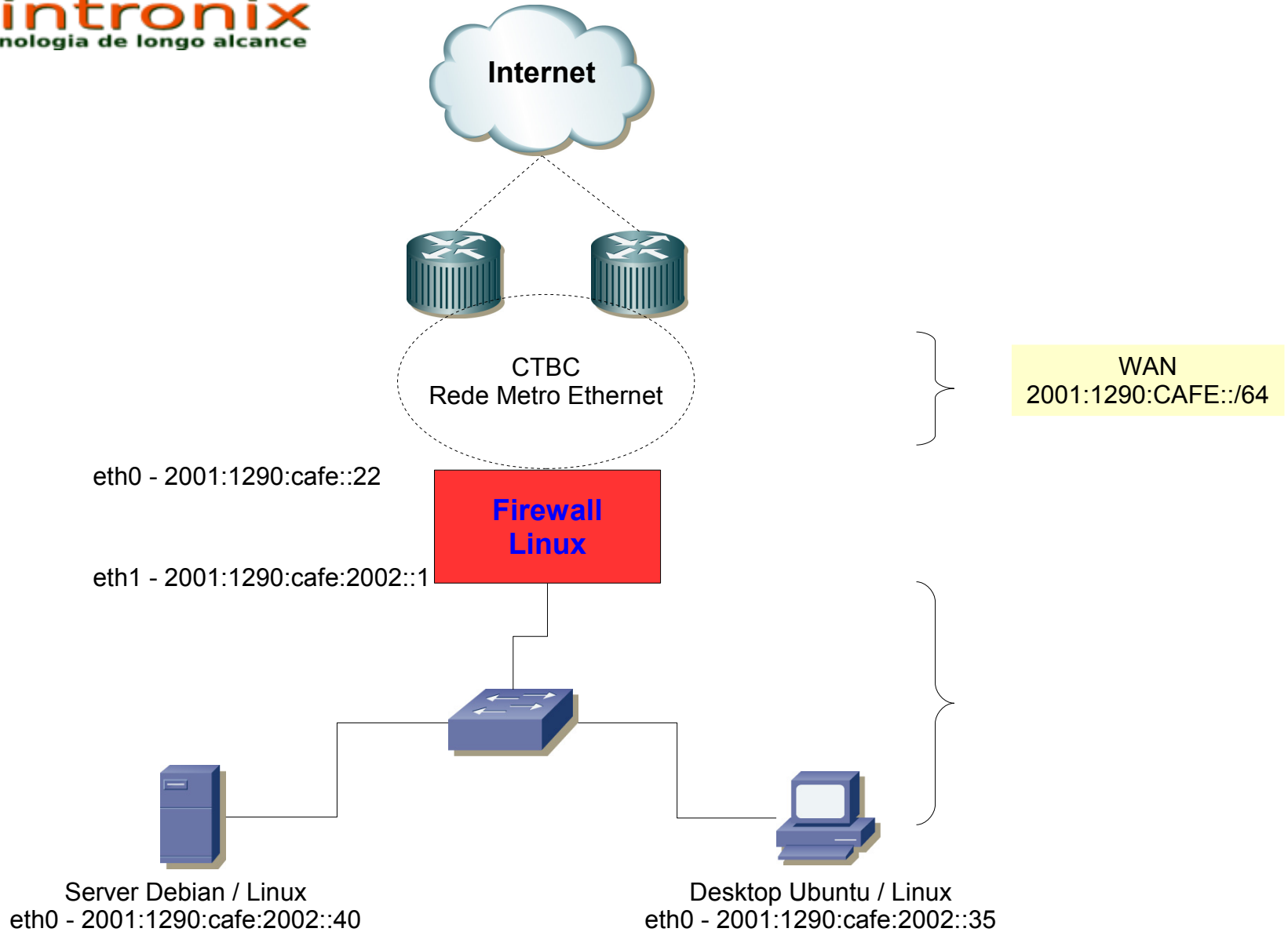
Casablanca **Online**



CTBC AS27664 IPv6 – Laboratory Logical Diagrams 3/4



CTBC AS27664 IPv6 – Laboratory Logical Diagrams 4/4



CTBC AS27664 IPv6 – Brief Network Checklist

Cisco Routers

- ✓ IPv6 Traffic - routing and forwarding
- ✓ IPv6 Remote Connection
- ➔ IPv6 SNMP Management
- ➔ IPv6 Flows Information Export – netflow v9 (use IPv4)

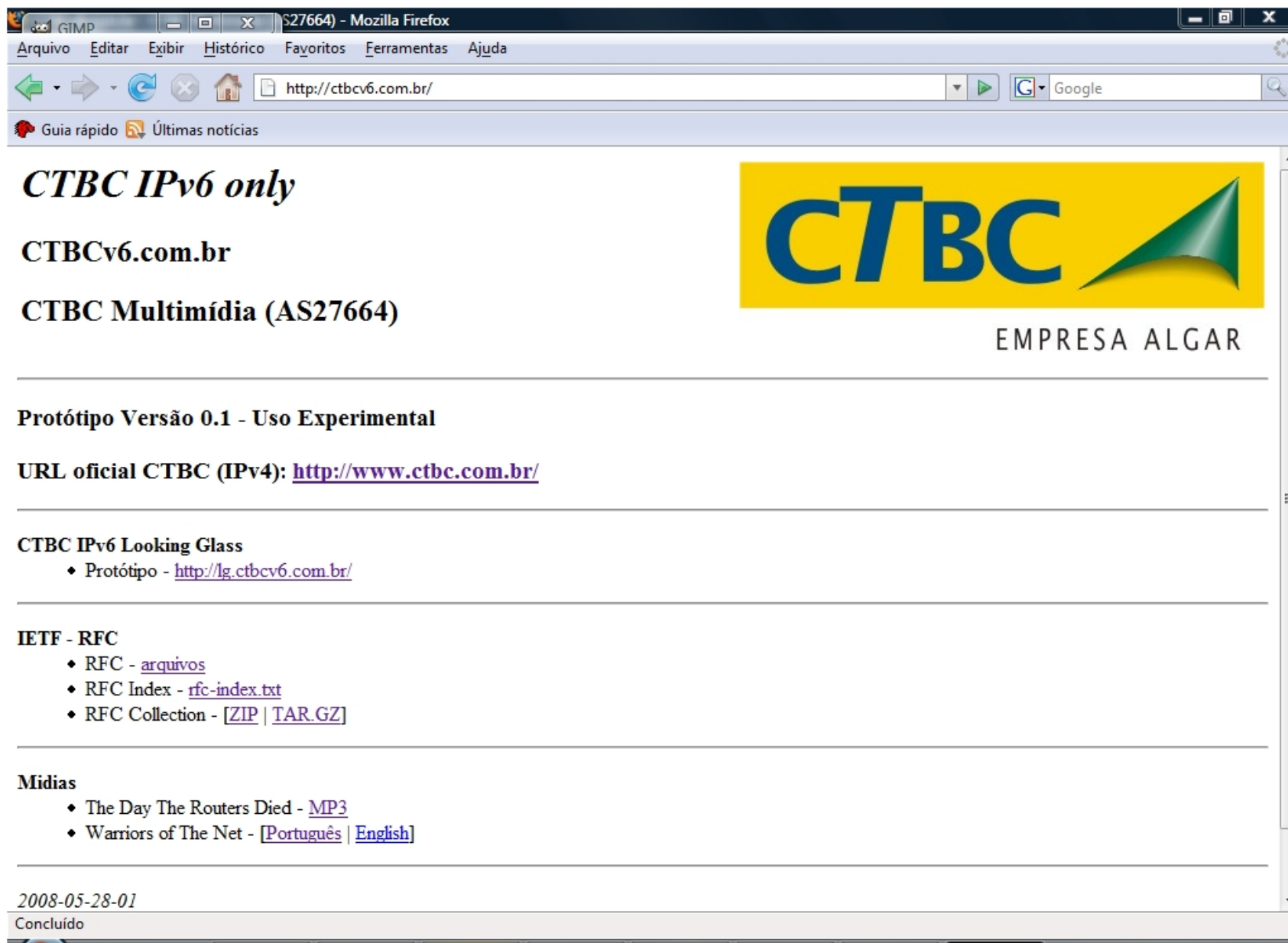
Servers – Linux and FreeBSD

- ✓ IPv6 Services (http, ssh, dns, etc)
- ✓ IPv6 Traffic – forwarding
- ✓ IPv6 Security – firewalls
- ➔ IPv6 Management Systems
- ➔ IPv6 Flows – capture and process

CTBC AS27664 IPv6 – Some Concerns

- IPv6 implementation demands time which means cost
- Few Brazilian NSP/ISP to exchange IPv6 traffic
- Connectivity tests shows quality difference between IPv4 and IPv6 of some international sites
Maybe related with tunnels use and/or suboptimal IPv6 traffic engineering
- Google search for IPv6 shows lots of URL about how to disable IPv6 in order to increase Internet performance for different end users systems (Windows, Linux, etc)

CTBC AS27664 IPv6 – Experimental URL Screen Shots - 1/5

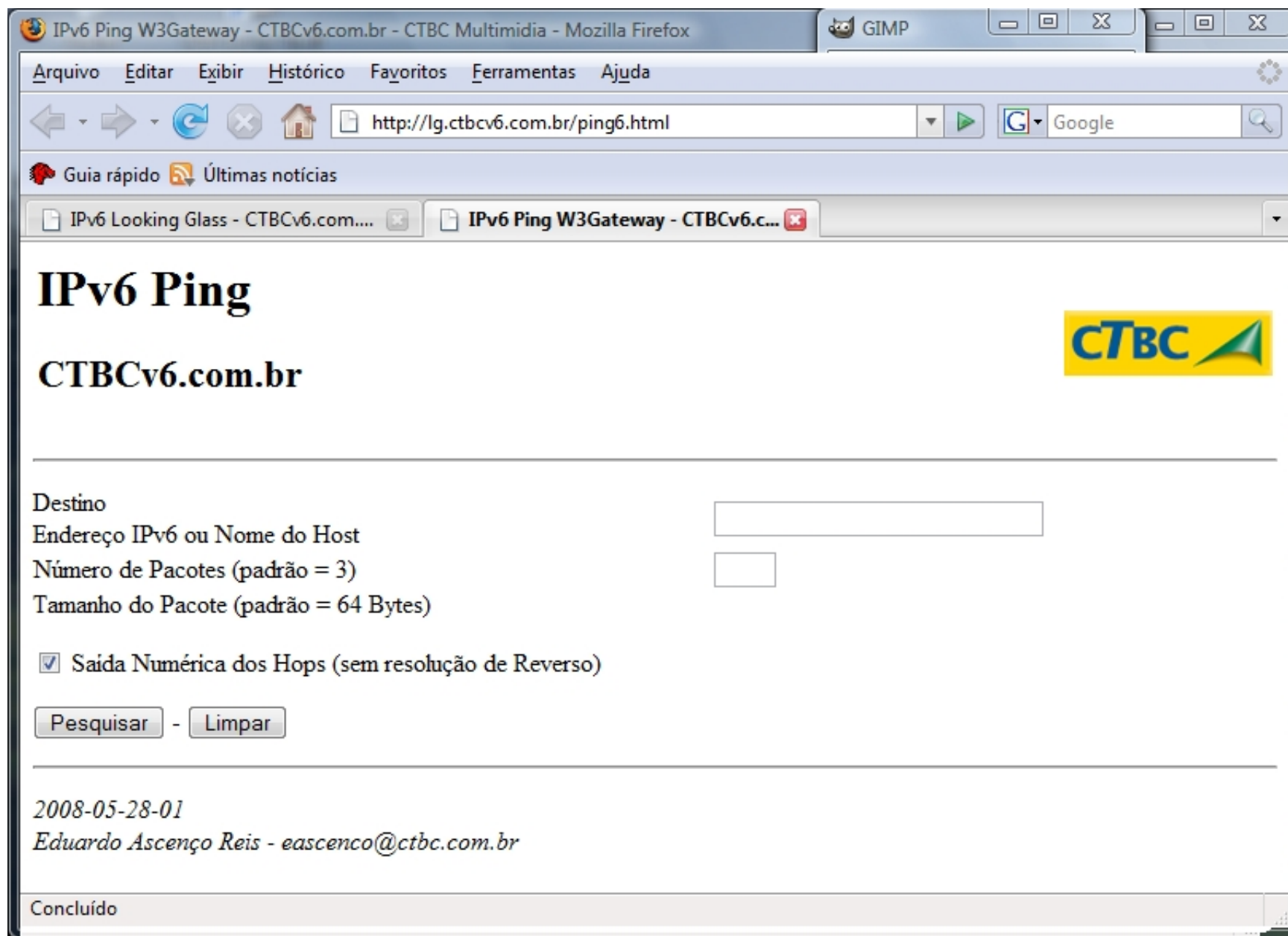


The screenshot shows a Mozilla Firefox browser window with the address bar displaying <http://ctbcv6.com.br/>. The page content includes:


- CTBC IPv6 only**
- CTBCv6.com.br**
- CTBC Multimídia (AS27664)**
- Protótipo Versão 0.1 - Uso Experimental**
- URL oficial CTBC (IPv4):** <http://www.ctbc.com.br/>
- CTBC IPv6 Looking Glass**
 - ◆ Protótipo - <http://lg.ctbcv6.com.br/>
- IETF - RFC**
 - ◆ RFC - [arquivos](#)
 - ◆ RFC Index - [rfc-index.txt](#)
 - ◆ RFC Collection - [[ZIP](#) | [TAR.GZ](#)]
- Mídias**
 - ◆ The Day The Routers Died - [MP3](#)
 - ◆ Warriors of The Net - [[Português](#) | [English](#)]

At the bottom of the page, the date **2008-05-28-01** and the status **Concluído** are displayed.

CTBC AS27664 IPv6 – Experimental URL Screen Shots - 2/5

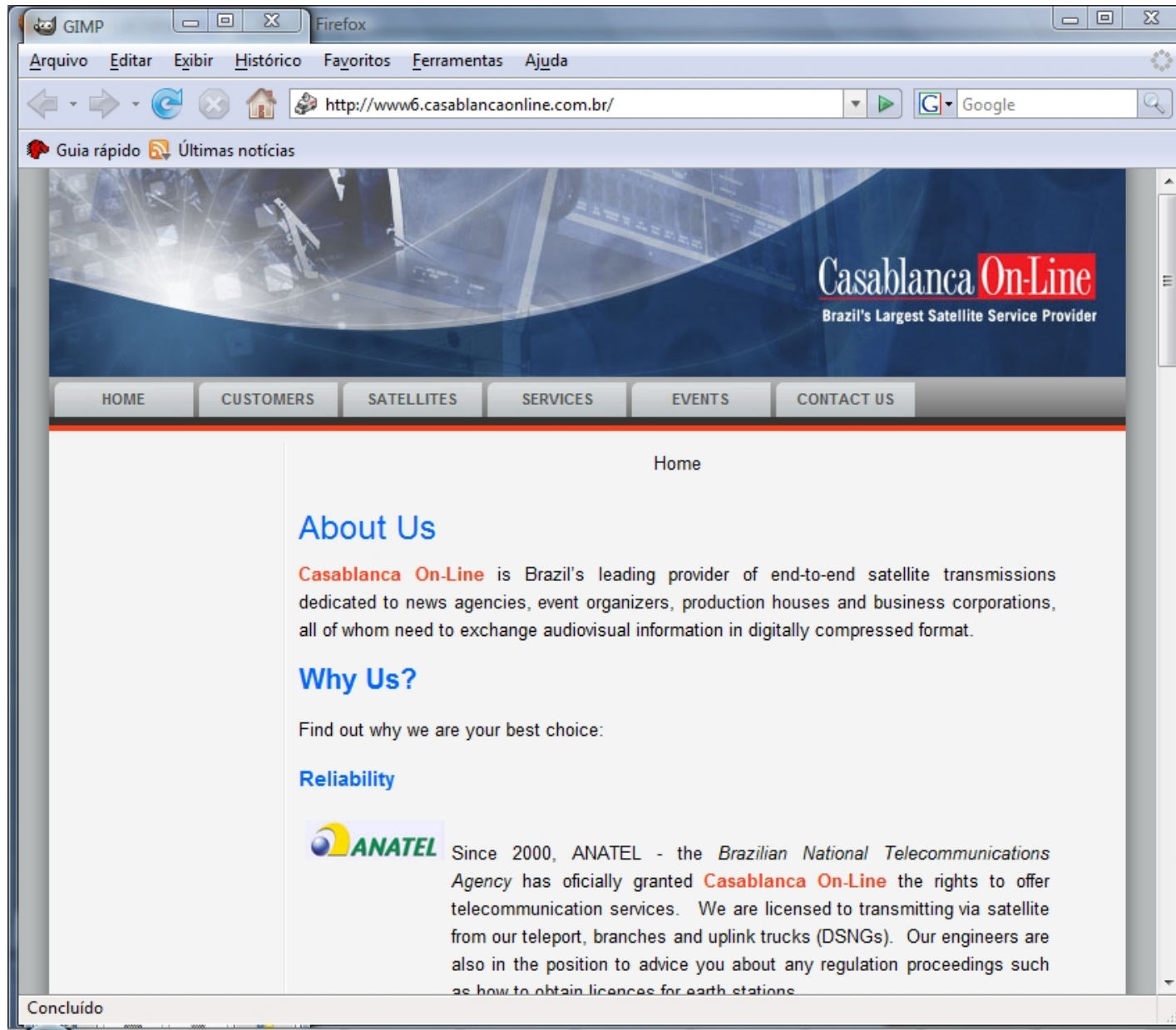


The screenshot shows a Mozilla Firefox browser window with the following details:

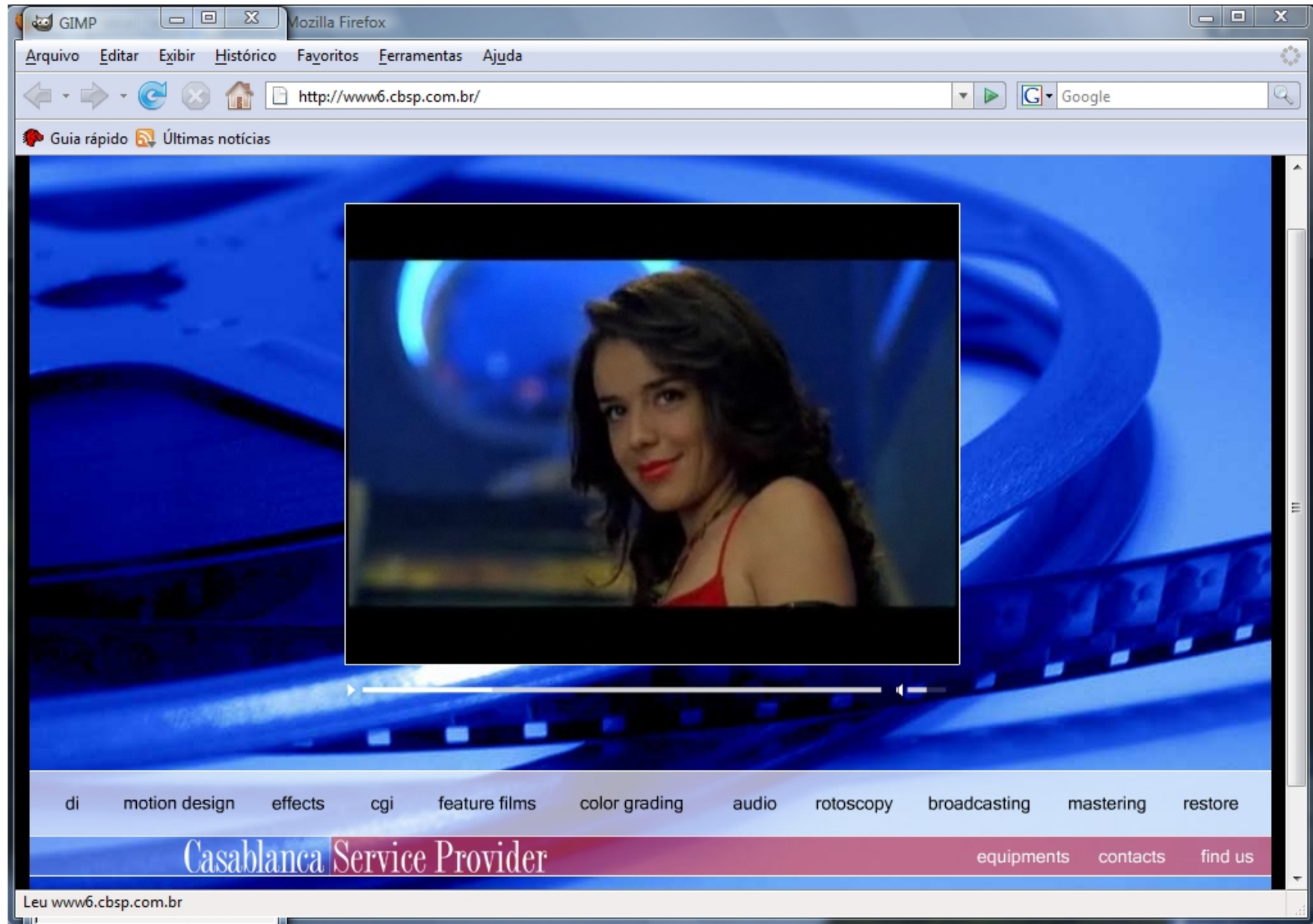
- Address Bar:** `http://lg.ctbcv6.com.br/ping6.html`
- Page Title:** IPv6 Ping W3Gateway - CTBCv6.com.br
- Page Content:**
 - # IPv6 Ping
 - ## CTBCv6.com.br
 - 
 - Form Fields:**
 - Destino (Endereço IPv6 ou Nome do Host):
 - Número de Pacotes (padrão = 3):
 - Tamanho do Pacote (padrão = 64 Bytes):
 - Saída Numérica dos Hops (sem resolução de Reverso)
 - Buttons: -
- Footer:**

2008-05-28-01
Eduardo Ascenço Reis - eascenco@ctbc.com.br
- Status Bar:** Concluído

CTBC AS27664 IPv6 – Experimental URL Screen Shots - 3/5



CTBC AS27664 IPv6 – Experimental URL Screen Shots - 4/5



CTBC AS27664 IPv6 – Experimental URL Screen Shots - 5/5



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tecnologia de longo alcance

Login: Senha: OK

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:: Principal ::

- Quem Somos
- O que Fazemos
- IPv6
- Downloads em IPv6
- Firewall
- VPN
- Proxy Web
- MSN Proxy
- Servidor de E-Mails
- Anti-SPAM
- Linux (Consultoria)
- Redes TCP/IP

:: Contatos ::



- Fixo: (11) 4169-5885
- Móvel: (11) 9985-6816
- cont@lintronix.com.br

IPv6 PARA TODOS!



O mundo tem que migrar para IPv6! É o que diz Vint Cerf, evangelista-chefe do Google. De acordo com ele, diversas tendências estão acontecendo em 2008, e aceleram o esgotamento dos IPs existentes. Os provedores de aplicativos para a internet irão pressionar os provedores de serviços de internet (ISPs) para que estes comecem a oferecer serviços compatíveis com o padrão IPv6.

Este site está inteiramente hospedado em um servidor IPv6 (ipv6lab.lintronix.com.br), como parte de um laboratório de testes em conjunto com a CTBC Telecom (www.ctbc.com.br).

Para testar um download em um servidor IPv6 clique aqui: [Arquivos para download](#)

O tão comentado esgotamento dos endereços IPv4 já está próximo de acontecer. Esteja preparado!

Se preferir entre e contato conosco: contato@lintronix.com.br

Diagrama de Rede:



Este diagrama simplificado, representa o

CTBC AS27664 IPv6 – Suggested URL to Visit & Special Thanks for the Support



CTBC - *Eduardo Ascenço Reis*

<http://ctbcv6.com.br/>

<http://lg.ctbcv6.com.br/>



Casablanca - *Pablo Martins Figueiredo da Costa*

<http://www6.cbsp.com.br/>

<http://www6.casablancaonline.com.br/>

<http://ipv6.casablancaonline.com.br/>



Lintronix - *Claudio Corrêa Porto*

<http://ipv6lab.lintronix.com.br/>

<http://ipv6forum-v6.lintronix.com.br/>